CLAIMS

1. A method for determining at least one mechanical parameter of at least one material in a composite system comprising at least two distinct phases (A, B), characterized in that it comprises:

a) the production of at least one specimen (L) comprising a first part of a first phase (A) and a second part of a second phase (B), the second part consisting of the material to be characterized, the specimen (L) having at least one dimension (t) small enough to allow the strains in said specimen to be relaxed;

b) the measurement, on said specimen (L), of at least one deformation parameter (β) of at least said first phase (A), in correspondence with a plurality of points lying at different distances from an interface between said first (A) and second (B) phases; and

c) the determination, from at least said deformation parameter (β), of at least one mechanical parameter of said second phase.

2. The method as claimed in claim 1, which comprises:

i) the production of a plurality of specimens (L) that differ from one another in respect of at least one geometrical property;

ii) the implementation of step b) on each of said specimens (L); and

iii) the use in step c) of the measurements made on said plurality of specimens.

3. The method as claimed in claim 1 or 2, in which, for at least one specimen (L), step b) is repeated at at least two different temperatures.

4. The method as claimed in one of the preceding claims, in which step c) comprises:

i) the modeling of the strain relaxation in said specimen (L) using a first estimate of at least one mechanical property of the material of said second phase (B);

ii) the comparison of the measurement results of step b) with those of said modeling; and

iii) the modification of said estimate of at least one mechanical property of the material of said second phase and the reiteration of substeps i) to iii) until the difference between said measurement results and the modeling results is minimized.

5. The method as claimed in claim 4, in which the modeling is a finite-element numerical simulation.

6. The method as claimed in any one of the preceding claims, in which said composite system is chosen from among: a substrate having a continuous layer on its surface; a substrate having metallization bands or islands on its surface; a layer with a zone included in the substrate; a transistor; a layer on the inside of a substrate; a matrix containing inclusions; fibers or filaments.

7. The method as claimed in any one of the preceding claims, in which said specimen (L) has at least one microscale or nanoscale dimension (t).

8. The method as claimed in any one of the preceding claims, in which said specimen (L) is a lamella having two approximately parallel faces lying approximately perpendicular to the interface between said first (A) and second (B) phases.

9. The method as claimed in claims 2 and 8, which comprises the production of a plurality of lamellae (L) of different thicknesses.

10. The method as claimed in any one of claims 1 to 7,

in which said specimen is a lamella placed at an angle to the interface between said first (A) and second (B) phases.

11. The method as claimed in claims 2 and 10, which comprises the production of a plurality of lamellae placed at different angles to the interface between said first (A) and second (B) phases.

12. The method as claimed in any one of the preceding claims, in which said specimen is a wedge-shaped lamella having two faces making an angle between them.

13. The method as claimed in claim 12, which comprises the production of a plurality of lamella(e) having two faces making different angles between them.

14. The method as claimed in any one of the preceding claims, in which the measurements provided in step b) are carried out by diffraction of a convergent electron beam.

15. The method as claimed in claim 14, in which step b) includes the observation of Holz lines for at least one crystallographic plane of said first phase (A) and the determination of at least one parameter from among: the width of said Holz lines, their position and their internal structure.

16. The method as claimed in claim 15, in which step b) comprises the determination of at least the width of at least some of said Holz lines and the calculation, for each of them, of a maximum rotation β_{max} along the axis of the electron beam.

17. The method as claimed in claim 16, in which step c) involves the plotting of at least one curve representing a said maximum rotation as a function of the distance relative to the interface between said

first (A) and second (B) phases.

18. The method as claimed in claim 17, in which step c) also involves, by simulation, the plotting of curves representing the maximum rotation β_{max} as a function of the distance relative to the interface between said first (A) and second (B) phases for possible values of Young's modulus and/or Poisson's ratio of the material of said second phase (B), and also the minimization of the difference between the simulated curves and the experimental curves in order to determine the Young's modulus and/or the Poisson's ratio of the material of said second phase (B).